Chem 313 – Midterm Review Practice Problems

**Chapter 1: Chemistry and the Science of Matter**

1. Using one of the following terms: *element*, *compound*, *solution*, or *heterogeneous mixture*, classify the

following materials.

1. methane gas (CH4) *Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. sugar dissolved in water *Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Air *Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Chocolate chip cookie dough *Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Brass *Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Zirconium *Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. Determine whether the following properties are physical or chemical by placing an “X” in the appropriate boxes.

|  |  |  |
| --- | --- | --- |
| Property | Physical | Chemical |
| Ability to rust |  |  |
| Conductivity |  |  |
| Mass |  |  |
| Color |  |  |
| Density |  |  |
| Flammability |  |  |

1. Determine whether the following processes represent physical or chemical changes by placing an “X” in the appropriate box.

|  |  |  |
| --- | --- | --- |
| **Process** | **Physical** | **Chemical** |
| **Filtration** |  |  |
| **Decomposition** |  |  |
| **Change in color** |  |  |
| **Crystallization** |  |  |

1. Determine whether the processes are endothermic or exothermic by placing an “X” in the appropriate box.

|  |  |  |
| --- | --- | --- |
| Process | Endothermic | Exothermic |
| Freezing of Bromine |  |  |
| An explosion |  |  |
| Boiling of water |  |  |

1. Record the technique and property which would be used to separate the following mixtures

|  |  |  |
| --- | --- | --- |
| Mixture | Technique | Property |
| A solution of salt water (to yield salt crystals) |  |  |
| A solution of alcohol and water |  |  |
| Spaghetti in a pot of water |  |  |

1. Calculate the density of a substance if its mass is 10.14 g and its volume is 11.8 mL.
2. What is the mass of gold brick that has a volume of 150mL? (The density of gold is 19.3 g/mL)
3. If 156g of mercury were measured in a graduated cylinder, what volume would you observe? (The density of mercury is 13.5 g/mL)

**Chapter 3: Scientific Measurement**

1. Write the following numbers in scientific notation.
2. 103220000 b)0.00453
3. Perform the following calculations and report your answers with proper scientific notation.

(6.8 x 1023) (2 x 10-8) 1.05 x 104 + 9.8 x 103 4.32 x 10-4/6.5 x 10-12

1. Convert the following.
2. 105 cL to hL b. 0.45 km to dm c. 10006 mg to g

1. Perform the following conversions using the factor label method. Report your answer in proper **scientific notation**.

|  |  |  |
| --- | --- | --- |
| *1.0 kg = 2.2 lb* | *1.0 L = 34.0 oz* | *3 ft = 1 yd 1.6km = 1 mi* |
| *1.0 in = 2.54 cm* | *1.0 m = 1.13 yd* | *5280 ft = 1 mi 12 in = 1 ft* |

1. How many yards are equal to 0.680 km?

*Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How many milliliters are there in 0.00018oz

*Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Light travels at 3.00 x 108 m/s; what speed is that in mi/hr ?

*Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Chapter 2: Matter is made of Atoms**

1. Complete the following table for the most common isotope

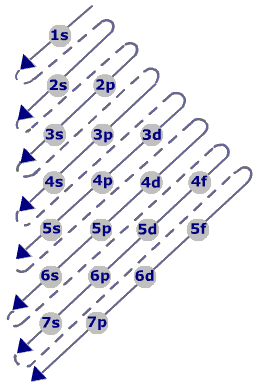
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Atomic Number* | *Mass Number* | *Number of Protons* | *Number of Neutrons* | *Number of Electrons* |
| 8 |  |  | 8 |  |
|  | 14 |  | 7 |  |
|  |  |  | 21 | 20 |

1. Calculate the atomic mass of element X given the following data.

|  |  |  |
| --- | --- | --- |
| Isotope | Mass | % Abundance |
| X-106 | 105.9035 | 52.60% |
| X-107 | 107.9039 | 36.46% |
| X-110 | 109.9052 | 10.94% |

*Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_*

1. Write the electron configurations for the following elements using the diagram provided.



Sodium:

Chlorine:

Iron:

1. Answer the following questions using the information given below. Be sure to report your answer in **scientific notation.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *c = 3.00×108 m/s* | *h = 6.626×10-34 Js* | *E = hν* | *c = λν* |  |

1. What is the wavelength, in meters, of light with a frequency of 7.32×1019 Hz?

*Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is the energy of a photon of light with a frequency of 2.98×107 Hz?

*Answer*: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which of the two waves above has greater energy? Support your answer using either math or a

written explanation.

**Chapter 3: Introduction to the Periodic Table**

1. Fill in the following table with the correct information.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | Chemical Family | Block | Lewis Dot Structure | Most common ion |
| Strontium |  |  |  |  |
| Iodine |  |  |  |  |
| Lead |  |  |  |  |
| Chromium |  |  |  |  |
| Berkelium |  |  |  |  |
| Antimony |  |  |  |  |
| Rubidium |  |  |  |  |
| Sulfur |  |  |  |  |

1. Which of the atoms in each pair is the largest?
2. Calcium or Strontium b. Oxygen or Nitrogen
3. Which of the atoms in each pair has the greatest electronegativity?
4. Fluorine or Bromine c. Sulfur or Oxygen
5. Which of the following elements are generally solids that conduct electricity?

Copper, Chromium, Phosphorus, Lead, Iodine, Xenon

**Chapter 4: Formation of Compounds**

1. Write the ionic equations for the formation of the following compounds.
2. NaF
3. Cu2S
4. AlBr3
5. Draw the structural formulas for the following compounds.
6. Cl2 b. CO2 c. CH4

**Chapter 5: Types of Compounds**

1. Fill in the ionic compound table below.

|  |  |  |  |
| --- | --- | --- | --- |
| Formula | Cation | Anion | Name |
| Na2S |  |  |  |
|  |  |  | Lithium nitride |
|  | Ba2+ | SO42- |  |

1. Fill in the covalent compound table below.

|  |  |
| --- | --- |
| Formula | Name |
| SO2 |  |
| N3Br7 |  |
|  | Tetraphosphorus hexafluoride |